

Ru-decorated Pt nanoparticles on N-doped multi-walled carbon nanotubes by atomic layer deposition for direct methanol fuel cells - DTU Orbit (09/11/2017)

Ru-decorated Pt nanoparticles on N-doped multi-walled carbon nanotubes by atomic layer deposition for direct methanol fuel cells

We present atomic layer deposition (ALD) as a new method for the preparation of highly dispersed Ru-decorated Pt nanoparticles for use as catalyst in direct methanol fuel cells (DMFCs). The nanoparticles were deposited onto N-doped multi-walled carbon nanotubes (MWCNTs) at 250 °C using trimethyl(methylcyclopentadienyl)platinum MeCpPtMe₃, bis(ethylcyclopentadienyl)ruthenium Ru(EtCp)₂ and O₂ as the precursors. Catalysts with 5, 10 and 20 ALD Ru cycles grown onto the CNT-supported ALD Pt nanoparticles (150 cycles) were prepared and tested towards the electro-oxidation of CO and methanol, using cyclic voltammetry and chronoamperometry in a three-electrode electrochemical set-up. The catalyst decorated with 5 ALD Ru cycles was of highest activity in both reactions, followed by the ones with 10 and 20 ALD Ru cycles. It is demonstrated that ALD is a promising technique in the field of catalysis as highly dispersed nanoparticles of controlled size and composition can be deposited, with up-scaling prospects.

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